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Endovascular retrieval of difficult to remove port-a-caths

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A B S T R A C T

Long dwelling central venous lines develop intravenous adhesions or a calcified fibrous sheath causing difficulties in removal. Although such cases are rare, a few cases of endovascular retrieval have been reported in pediatric literature. We report our experience with 6 cases in children with port-a-caths. Transfemoral snare technique was effective in all but 1 patient. The mean age of the in dwelling port-a-caths was 5 years. One patient whose catheter could not be removed has developed no complications after a follow-up of 5 years. Review of literature suggests that while endovascular retrieval is not without risks, leaving a central line in situ has no major disadvantages. Heroic measures to remove such lines should be pursued only when absolutely necessary as in the case of an infected line.

1. Introduction

Central venous lines when left in situ for a long time very rarely develop adhesions and calcifications intravascularly [1]. This makes removal by external traction difficult and increases chances of breakage of the catheter with distal embolization. Several ways to remove these catheters have been reported and endovascular retrieval has been one of the most common techniques utilized. While very few cases have been described in literature, the incidence of catheter related complications, if catheter is left in situ when it cannot be removed using the usual surgical techniques, is not clear. Also, the risks of such retrievals are not well described. The aim of the study was to elucidate potential risk factors that may indicate future difficulty with catheter removal and describe the outcomes for such difficult catheter removals.

2. Methods

All patients requiring endovascular retrieval of portions of retained central venous catheters and/or intravascular foreign bodies, between June 2013 and December 2018, were identified using an internal billing database. Patients were cared for at a tertiary pediatric hospital with full-time interventional radiology expertise. Patient demographics and disease characteristics, characteristics of the central line, techniques used for retrieval, and outcomes were recorded. Continuous data was expressed as means and standard deviations.

3. Results

7 patients requiring endovascular retrieval of intravenous foreign bodies were identified over this 5-year period. Of these, 6 were intravenous-portions of port-a-caths (PC) and 1 was a retained segment of guidewire after attempted placement of a non-tunneled line. The latter patient was excluded from the study. We had no patients who required endovascular assistance for removal of non-tunneled subclavian or jugular central venous lines.

There were 693 Port-a-cath retrievals performed by open surgical technique during the study time period. The rate of retained PCs was 0.9% (6/693). The mean age of the patients was 11.1 ± 4.8 yrs [Range 5.4–17.2 yrs]. The duration of the PC since original placement was 5.3 ± 2.4 yrs [Range 3.3–8.9 yrs]. All PCs were placed via the subclavian-route. Most (4/6) were left sided. All catheters were made of silicone. The diagnosis requiring ports was varied with only 2 patients requiring it for chemotherapy for malignancy (Table 1).

One PC was removed via the subclavian-route by the surgeon while interventional radiology (IR) placed a protective snare through the femoral-route. One catheter could not be removed and was left in situ. This catheter was adhered to the endothelium of the brachiocephalic vein at the distal end and could not be removed by either the femoral snare technique (described below) or by passing a Fogarty balloon into the ipsilateral brachiocephalic vein in order to free the central end of the catheter. This patient had the longest duration of catheter left in situ (8.9 months). All other retained portions of PCs were removed via the femoral route by IR with snare technique. All IR procedures occurred during the same OR procedure as the surgical removal. The procedure in all cases consisted of gaining femoral venous access and advancing a large vascular-sheath over the guidewire. A gooseneck-snare was then advanced through the sheath and the distal end of the PC was grasped and removed from the groin. Post procedure fluoroscopy was performed to verify absence of catheter fragments.

No procedure related complications occurred. There was no catheter breakage or embolization in any patient. Examination of all central lines showed adhered areas of endothelium on the distal ends of the

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Table-1
Diagnosis of patients requiring port-a-cath placement.

Patient 1	CHARGE syndrome (need for TPN)
Patient 2	developmental delay, pancreatitis (need for TPN)
Patient 3	T-ALL (chemotherapy)
Patient 4	nephrotic syndrome (albumin infusions)
Patient 5	Hemophilia (Blood transfusions)
Patient 6	ALL (chemotherapy)

catheters. The patient who had the catheter left in situ has had no complications related to the PC after a follow-up of 58 months.

4. Discussion

The first report of the need for endovascular retrieval of a retained intravascular foreign body was in 1954 where there was accidental passage of a peripheral catheter into the right atrium [2]. Since then this rare procedure has been reported in small case series. Rates of such difficult removals vary in literature with most case series reporting rates of around 1% [3].

One of the largest reviews of retained catheters managed by endovascular retrieval was by Schechter et al., which included both adult as well as pediatric patients. Reporting all published case series from 2000 to 2012, they identified 574 patients who had intravenous foreign bodies retrieved. Most of these were retained catheter fragments. The technique used by all of these studies was endovascular snare retrieval. Stone baskets were used occasionally. Failure of retrieval ranged from 2.2 to 11% [4].

The largest series in pediatric patients consisted of 58 patients with “difficult to remove” central venous lines (all port-a-caths). While intravenous retrieval was required in only 11 of these patients, most other catheters were able to be removed by additional traction and/or more than normal dissection. Catheters were able to be removed in all but one patient. Snares were again the most commonly used technique for removal followed by insertion of a “peel away” sheath around the port-a-cath [3].

A more recent case series in pediatric patients by Chan et al. reported 10 cases with 7 attempted retrievals. Mean time of indwelling catheters was 66.5 months – very similar to our study. All retrievals were performed by the transfemoral snare technique. Retrieval was successful in all but 1 patient. The 4 patients managed conservatively developed no complications related to the central line over their 10-year study period. They also described a total of 28 cases (in addition to their series) previously reported in pediatric literature from 2001 to 2012 [5–16]. Most studies which attempted removal of these lines used the femoral snare technique as was used in our patients. Few other techniques have been reported. Some of the latter include use of an Excimer laser, a Lead Locking device [10] and using a guidewire to exert a push-pull force [7]. One study reported extensive open dissection with a clavicle resection and venotomy [11]. 17 of these 38 patients have had lines left in situ (either intentionally or due to failed retrieval) and none of the patients have had any complications related to the central line after a median follow-up of 40 months. They report an overall failed retrieval rate of 30%. Attempted retrieval is not without complications as they reported intra-operative thrombo-embolization in 8% of the patients and line embolization in 8% of patients [17].

Our case series is a further addition to literature, where patients with prolonged indwelling port-a-caths needed endovascular retrieval of retained intravascular segments of catheter. Retrieval was performed using the transfemoral snare technique in all but one patient. One catheter out of 6 could not be retrieved and this patient has had no complication associated with the central line. We had no intra-operative complications in our series. We found prolonged indwelling time to be a consistent risk factor for difficult retrieval. All our central lines were made of silicone and literature review does not show a consistent risk associated with the type of material for the catheter (silicone versus polyurethane) [18]. Like in our study, most cases in literature have been left sided [17]. However, unlike in our study population, the predominant requirement of central lines was for chemotherapy for hematologic malignancies in older studies [17].

While endovascular retrieval is successful in most cases, it is not without complications. Decision to remove a retained central line should be made after a thorough discussion of the risks/benefits of such a procedure with the patient and family. This study and literature review should help such informed decision making.

5. Conclusions

Retained portions of central venous catheters requiring endovascular retrieval are extremely rare. While endovascular removal is successful in most cases, this should be performed by an experienced team to avoid complications. Leaving the catheter in situ has not shown major disadvantages but longer-term data does not exist for consideration. Decisions for aggressive surgical maneuvers to remove retained lines should be balanced against long-term risks on leaving a catheter in situ. To avoid difficult catheter retrieval and possible retained catheters, catheter exchanges every 1–2 years should be considered.

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Authorship

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Conflict of interest

All listed authors declare no conflict of interest.

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